COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1401 EAST BROAD STREET
RICHMOND, VIRGINIA 23219 2000

Gregory A. Whirley
Commissioner

March 8, 2013

MEMORANDUM

TO: Gregory A. Whirley, Commissioner

FROM: Garrett W. Moore
Chief Engineer

SUBJECT: Preliminary Report of I-64/I-264 Pothole Issue Hampton Roads

Per your request, attached is a copy of the Preliminary Report of the I-64/I-264 Pothole Issue in Hampton Roads.

Attachment

cc: Charlie A. Kilpatrick, P.E.

Preliminary Report of I-64/I-264 Pothole Issue Hampton Roads

March 8, 2013

SCOPE

This preliminary report, led by Virginia Department of Transportation (VDOT) Chief Engineer, consisted of field visits by VDOT staff to I-64 from the Hampton Roads Bridge Tunnel to Virginia Beach and the entire stretch of I-264 from Norfolk to Virginia Beach and interviews of VDOT staff between February 9 and February 27, 2013. This initial report has been reviewed with VDOT's contractor TME Enterprises (TME). TME performs maintenance work under the Turnkey Asset Maintenance Services (TAMS) contract for interstates in the southside. However, due to the limited time for this preliminary report, it is recommended that further review and interviews be undertaken between TME and VDOT for a final report.

BACKGROUND

In early February 2013 VDOT received numerous reports of potholes and unsafe pavement conditions on interstates in the Hampton Roads area. Sections of both I-264 and I-64 have reached the point where some portions of the concrete have lost their structural integrity [1]. Both the number and size of potholes impacted driver behavior. Both I-264 and I-64 have contracts, either completed, underway, awarded or planned, for major repair/rehabilitation. In the 1960s, both of the facilities were typically constructed with 9" of hydraulic cement concrete pavement with only the outermost and innermost lanes (having been added later to the middle two lanes) containing a drainage layer underneath (attached plan sheets) [2]. The 9" thickness is less than 75 percent the recommended design standard for current concrete roadway construction [3]. The standard pavement design thickness has been increased to accommodate the increased truck loading and to provide for a longer service life. While the majority of the intestates in the Hampton Roads District are in good condition, the sections of I-264 and I-64 are in poor to very poor condition [1]. These poor conditions and the numerous potholes prompted the Commissioner to request this report.

POTHOLES

Turnkey Asset Maintenance Services Contract Requirement

Contract performance criteria for asphalt and concrete surfaces require that, "temporary repairs to potholes 6"x6"x 1½" deep or larger shall be repaired immediately upon notification or discovery. All others within 2 days of notification or discovery. Permanent repairs to potholes/pavement failures shall be completed within 30 days of notification...Pavement obstructions that present a safety hazard shall be mitigated immediately." [4]

Observations/Findings

Large portions of I-264 have experienced the formation of many potholes. The TAMS contractor responsible for all ordinary roadway maintenance activities for this facility has not performed repair activities on these potholes (either temporary or permanent) in a manner or at a rate sufficient to

maintain a "safe, durable, and smooth surface" as specified on page 10 of 13 of the current version of Attachment 2: *TAMS Performance Criteria* of the TAMS contract [4,5]. Based on an inspection by VDOT's Chief Engineer on February 9, 2013, sections of I-64 east of Hampton Roads Bridge Tunnel also had potholes of sufficient size and number to require evasive maneuvers by drivers.

On February 9, VDOT crews started assisting with pothole repair on the interstate. As of February 27, VDOT crews and VDOT contracted crews had repaired potholes using in excess of 45 tons of asphalt and exceeding a cost of $200,000. These costs should be considered for reimbursement from the TAMS contractor.

The VDOT investigation team interviewed Hampton Roads District personnel associated with the contract on February 14, 2013 and VDOT Central Office staff on February 15, 2013 [6,7]. Personnel indicated that pothole repair requests were received from the VDOT Customer Service Center, Virginia State Police, VDOT's Safety Service Patrol, and VDOT contract monitors. In the workflow described, Hampton Roads VDOT and the TAMS contractor follow a cumbersome reporting system consisting of:

1. Calls come to the VDOT Customer Service Center reporting the pothole.
2. Customer Service Center notifies Hampton Roads Interstate Maintenance office by email with a link to the Asset Management System work order.
3. Hampton Roads Interstate Maintenance office sorts the work orders by section of pavement and delivers and assigns to a contract monitor.
4. Contract monitors sort the work orders and notify the TAMS contractor.
5. The TAMS contractor then schedules the work, except for emergencies, by submitting a request for lane closure to VDOT through the Lane Closure Advisory and Management System by each Thursday for the following week's work.
    a. In emergencies, large potholes were scheduled for immediate repair.
6. The Hampton Roads Interstate Maintenance Office either approved or disapproved the non-emergency work for the following week.

VDOT pothole repair records from January 1, 2013 through February 14, 2013 were cross referenced with data that reflect the TAMS contractor activities [8,9]. However, because of issues with the timeliness of data entry and the inconsistencies between datasets, definitive conclusions could not be drawn. The contract language requires potholes above a threshold (greater than 6"x6"x1½") to be repaired immediately upon notification and all others be repaired within two days. Permanent repairs to potholes/pavement failures are to be completed within 30 days [4]. VDOT records indicate that many potholes reported on February 8 and 9 were still not marked complete as of February 14 [8].

Interviews with VDOT Hampton Roads District personnel responsible for contract administration indicated that it is routine for pothole repair to be done outside the time frame specified in the contract [6,10], often due to traffic constraints. A VDOT employee stated the TAMS contractor was not actively looking for potholes prior to notification by others [10].

There are very few instances or records of consistent permanent patching by the TAMS contractor as defined in the contract [4] and described in the AASHTO manual [11]. Interviews with local contract monitors indicate that prior to this review, permanent patching was typically not done [6,10].

Recommendations

- VDOT should consider billing the TAMS contractor or deduct from future payment the expenses for repair provided by VDOT.
- VDOT should simplify and expedite its reporting and response process for communicating and conducting maintenance work to be performed by TME.
- The TAMS contractor should take more proactive measures in performing preventative maintenance measures to help keep potholes from forming.
- VDOT and the TAMS contractor should meet and discuss ways to address these recommendations and improve the pothole repair process, including routine patrols for pothole discovery.

PREVENTIVE MAINTENANCE

Contract Requirement

Section IV of the contract states, "The Contractor shall manage the routine ordinary maintenance and perform minor repairs on all assets within the project limits... Routine/Ordinary maintenance is further defined as preventive maintenance and minor repairs: Preventive Maintenance: Any planned activity performed in advance of a need for repair or in advance of accumulated deterioration."[4]

Observations/Findings

The TAMS contractor and VDOT (from interviews and inspection of the road) have followed a reactive rather than a proactive approach to correcting, preventing, and delaying the rate of deterioration. There was no effective proactive intervention by VDOT Operations staff and Maintenance staff at the senior levels to prevent this from happening. A site review indicates that no preventative maintenance (i.e. crack sealing) has been performed on this section of pavement. Observations indicate that extensive cracking is present. Crack sealing is allowed but not specifically required by the contract. It is an effective preventive measure that would have reduced deterioration of the concrete [11]. Based on interviews, the materials used to fill the potholes were on VDOT's approved materials list [6,10]. However, the materials chosen (such as bulk cold mix) were not effective at lasting through rain and traffic. Choosing other materials would have been more effective.

Recommendations

- The TAMS contractor should take proactive actions including preventative maintenance items such as crack/joint sealing, quick repair of potholes using more durable materials, and permanent repair using materials that hold up under the traffic and weather (such as saw cutting and filling with hot mix asphalt or hydraulic cement concrete). Unfortunately, the

opportunity to prevent deterioration through preventative maintenance would have been much more effective 4-5 years ago, before the pavement reached its current state of deterioration. Even so, the contractor should have been aware of existing pavement conditions when it entered into the contract and its maintenance work should have taken this into consideration.

- VDOT Hampton Roads District Administrator, District Maintenance Engineer, and the TAMS contractor shall meet every two weeks to: 1) evaluate the level of performance on recent accomplishments, 2) identify any corrective actions needed, and 3) review planned preventive maintenance activities. A report documenting the bi-weekly meetings should be presented to the Chief Engineer. While there are daily on-going meetings under the emergency directive, this recommendation puts in place a permanent meeting structure to monitor the contract performance throughout the remainder of the existing contract.

PAVEMENT CONDITION AND TURNKEY ASSET MAINTENANCE SERVICES CONTRACT LANGUAGE

Contract Language

Contract language indicates that the roadway surfaces outcome shall be "Safe, Durable, Smooth."[4]

Observations/Findings

All TAMS contracts undergo a review by a third party to evaluate pavement conditions of all roads under the TAMS contract. The third party uses an evaluation methodology approved by the State Maintenance Engineer. This evaluation is referred to as the Maintenance Rating Program (MRP) for pavements. The four MRP pavement evaluations that have been performed for the Hampton Roads TAMS contract (TME Enterprises) since this program was put in place have resulted in acceptable scores [12,13,14,15]. In order to evaluate the effectiveness of the MRP evaluation process for pavements, the investigation team considered the following factors:

1. The Hampton Roads Pavement Condition Data for 2012, which is not part of the contract, showed I-264 to be in very poor condition [1].
2. The current MRP pavement evaluation process does not consider pavement sections that are included in pavement rehabilitation contracts, and
3. The rapid deterioration rate of 10 to 25 year-old concrete patches is of concern and will require further forensic investigation. The original I-64 and I-264 pavements were constructed in the 1960s.

Employee interviews indicated in prior years the Hampton Roads District prioritization of pavement projects for rehabilitation were not always aligned with pavement condition ratings [10]. More recently, however, $36 million has been expended on I-64 and I-264 and an additional $45 million is programmed or under contract for I-64 and I-264 [16]. There appears to be a gap or disconnect between the scheduled permanent rehabilitation and replacement contracts and the necessary repair and replacement to maintain a safe, durable, and smooth surface that is not being provided by the TAMS

contractor. The pavement continues to be vulnerable to extensive damage until more durable repairs are performed.

Recommendations

- VDOT should establish a task force made up of Hampton Roads District staff, VCTIR, FHWA, and the completed I-66 rehabilitation (Rt. 50 to I-495) project members to have I-64/I-264 long term design-build proposals for rehabilitation and sealing ready for July 30, 2013 advertisement.
- VDOT Hampton Roads District should develop a revised schedule to more aggressively pursue and accelerate repair/rehabilitation on roads that are in poor to very poor condition (CCI 30 or less) that include or are soon followed by a structural overlay that seals and increases pavement thickness to modern standard [3]. This should include adding incentives for early completion of contracts underway.
- VDOT Maintenance Division (with assistance from VCTIR) should immediately review and revise the MRP protocol and requirements for future contracts to ensure it more closely supports a continuous safe, durable, and smooth road surface. This should include the site selection criteria which currently excludes sites under other repair contracts.
- VDOT Maintenance Division should review other TAMS contracts to determine if there are highways under purview of these contracts that are in poor / very poor condition. Based on the review, the Maintenance Division should ensure that the TAMS contractor is providing the necessary preventive work to ensure a safe, smooth and durable highway.
- VDOT should develop alternatives to using performance based contracts for highway segments with extensive sections of pavement rated as poor/very poor. VDOT should manage these sections with owner controlled contracts until the pavement conditions have been improved.

STAFFING

VDOT Hampton Roads District leadership will need to better focus and coordinate internal actions to get I-64/I-264 pavements to acceptable conditions. Leadership must also set firm expectations to monitor performance and hold staff accountable on maintenance activities in the district.

WHAT COULD HAVE PREVENTED FAILURES OF FEBRUARY 8, 2013?

One or more of the following could have prevented this failure:

Immediate preventative actions by the Turnkey Asset Maintenance Services contractor:

1. *Immediate temporary patching by the Turnkey Asset Maintenance Services contractor using more durable special products or hot mix.*

2. *Early intervention in the form of timely and substantial permanent patching by the TAMS contractor.* More permanent patching work, as described on pages 57-58 in the *AASHTO Maintenance Manual for Roadways and Bridges 2007* [11], such as saw cutting and fill with hot asphalt plant mix or hydraulic cement concrete would have helped to minimize the excessive and largest potholes.
3. *Sealing cracks and joints to prevent moisture infiltration from causing freeze and thaw damage as well as infiltration into and potentially softening the base/subgrade.*
4. *Proactively addressing potholes or damage before they had grown into larger failures.* VDOT will be meeting with TME to review their records to determine to what extent proactive measures were taken by TME. Based on VDOT observations, TME did not proactively monitor the roads to prevent potholes from forming or becoming severe.

Major preventative actions by VDOT:

1. *Major rebuild of the current 9" thick [2] deteriorated hydraulic cement concrete pavement to modern standard* (typically a 13" concrete pavement or equivalent flexible pavement (hot mix asphalt surface) with full subgrade drainage [3]).
2. *Earlier or more aggressive full rehabilitation with saw cutting and replacement of all deteriorated hydraulic cement concrete.* For the patches to be effective and durable for modern loading, the entire pavement thickness would need to be increased to about 13" using hydraulic cement concrete or a hydraulic cement concrete and a hot asphalt plant mix overlay totaling 13". A practical way to do this under traffic would be to provide a bituminous seal for joints, overlay the repaired concrete with 1" Thin Hot Mix Asphalt Concrete Overlay (THMACO), and place two 2" layers of surface mix asphalt – potentially Stone Matrix Asphalt to reduce the stresses in the concrete. If funding were not available in a single year, joint sealing and THMACO layer could be placed followed by surface asphalt layers in subsequent years.
3. *Seal or overlay after original repairs to extend the life of the patches.* Observations show more deterioration in the full depth repairs than in the original concrete. Statements have put these patches at 10 – 25 years old, but this age has not been verified with contract documents. Also, there are no indications that preventative maintenance was provided for these pavement sections since the installation of the concrete patches.

SUMMARY OF RECOMMENDATIONS

Recommendations going forward are:

- VDOT should bill the TAMS contractor or deduct from payment the expenses for repair provided by VDOT.
- VDOT should simplify and expedite its reporting and response process for communicating and conducting maintenance work to be performed by TME.

- The TAMS contractor should take more proactive measures to prevent potholes from forming.
- VDOT and the TAMS contractor should meet and discuss ways to address these recommendations and improve the pothole repair process, including routine patrols for pothole discovery.
- The TAMS contractor should take proactive actions, including preventative maintenance items such as crack/joint sealing, quick repair of potholes using more durable materials, and permanent repair using materials that hold up under the traffic and weather (such as saw cutting and filling with hot mix asphalt or hydraulic cement concrete). Unfortunately, the opportunity to prevent deterioration through preventative maintenance would have been much more effective 4-5 years ago, before the pavement reached its current state of deterioration. Even so, the contractor should have been aware of existing pavement conditions when it entered into the contract and its maintenance work should have taken this into consideration.
- VDOT Hampton Roads District staff and the TAMS contractor shall meet every two weeks to: 1) evaluate the level of performance on recent accomplishments, 2) identify any corrective actions needed, and 3) review planned preventive maintenance activities. A report documenting the bi-weekly meetings should be presented to the Chief Engineer. While there are daily on-going meetings under the emergency directive, this recommendation puts in place a permanent meeting structure to monitor the contract performance throughout the remainder of the existing contract.
- VDOT should establish a task force made up of Hampton Roads District staff, VCTIR, FHWA, and the completed I-66 rehabilitation (Rt. 50 to I-495) project members to have I-64/I-264 long term design-build proposals for rehabilitation and sealing ready for July 30, 2013 advertisement.
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- VDOT Maintenance Division (with assistance from VCTIR) should immediately review and revise the MRP protocol and requirements for future contracts to ensure it more closely supports a continuous safe, durable, and smooth road surface. This should include the site selection criteria which currently excludes sites under other repair contracts.
- VDOT Maintenance Division should review other TAMS contracts to determine if there are highways under purview of these contracts that are in poor / very poor condition. Based on the review, the Maintenance Division should ensure that the TAMS contractor is providing the necessary preventive work to ensure a safe, smooth and durable highway.
- VDOT should develop alternatives to using performance based contracts for highway segments with extensive sections of pavement rated as poor/very poor. VDOT should

manage these sections with owner controlled contracts until the pavement conditions have been improved.

REFFERENCES

[1] Virginia Department of Transportation, *Hampton Roads District Pavement Condition Data 2012*, VDOT Maintenance Division.

[2] Commonwealth of Virginia Department of Highways, Plan and Profile of Proposed State Highway, City of Norfolk (multiple plan sets). 1963-1995.

[3] Virginia Department of Transportation, 2003. *Guidelines for 1993 AASHTO Pavement Design* (revised May 2003). VDOT Materials Division, Pavement Design and Evaluation Section.

[4] Virginia Department of Transportation Turnkey Asset Maintenance Services Contract Performance Criteria, 200-JB (Hampton Roads), 2008. (Including all change orders.)

[5] Turnkey Asset Maintenance Services Contractual Timeliness Requirements Standard Operating Procedures, March 2010.

[6] Interviews with Hampton Roads VDOT personnel, February 14, 2013.

[7] Interview with E. Heltzel and R. Prezioso, February 15, 2013.

[8] Virginia Department of Transportation Asset Management System Data, 2013.

[9] AMS Work order to TME CAMS Work Orders, February 27, 2013.

[10] Interviews with Hampton Roads VDOT personnel, February 25, 2013.

[11] American Association of State Highway and Transportation Officials, *Maintenance Manual for Roadways and Bridges 2007*.

[12] Virginia Department of Transportation, *Hampton Roads Turnkey Asset Maintenance Services (TAMS) Maintenance Rating Program (MRP) Evaluation Results – Cycle 1*. March 2011.

[13] Virginia Department of Transportation, *Hampton Roads Turnkey Asset Maintenance Services (TAMS) Maintenance Rating Program (MRP) Evaluation Results – Cycle 2*. October 2011.

[14] Virginia Department of Transportation, *Hampton Roads Turnkey Asset Maintenance Services (TAMS) Maintenance Rating Program (MRP) Evaluation Results – Cycle 1*. April 2012.

[15] Virginia Department of Transportation, *Hampton Roads Turnkey Asset Maintenance Services (TAMS) Maintenance Rating Program (MRP) Evaluation Results – Cycle 2*. October 2012.

[16] Project Cost Summary, information as of February 20, 2013.

REFERENCE SOURCES:

1. **Robbie Prezioso (hard copy)**
2. **Chief Engineer (hard copy)**
3. **Materials Division**
4. **Robbie Prezioso**
5. **Robbie Prezioso (hard copy)**
6. **N/A**
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9. **Michael Sprinkel (hard copy)**
10. **N/A**
11. **Michael Sprinkel (partial hard copy)**
12. **Robbie Prezioso**
13. **Robbie Prezioso**
14. **Robbie Prezioso**
15. **Robbie Prezioso**
16. **Michael Sprinkel (hard copy)**